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New mosses of North America. II.

F. RENAULD AND J. CARDOT.[1]

(WITH PLATES XII–XIV.)

Microbryum Flœrkeanum Sch. var. HENRICI.—Differs from the typical form in the green color of the plant and the excurrent costa, often hyaline at the point.

Kansas: Saline county, on sandy ground (*Joseph Henry*).

Weisia viridula Brid. var. NITIDA.—Characterized by the shorter leaves, and the narrow, subcylindrical capsule, shining as though varnished and distinctly sulcate when dry.

Florida (*Fitzgerald*). Louisiana: Station Slidell, on sandy ground (*A. B. Langlois*).

Dicranum hyperboreum C. Müll. var. PAPILLOSUM.—Differs from the type in its leaves shorter, deeply canaliculate, papillose on the back, and the costa strongly rugose.

Greenland.

DICRANUM SABULETORUM.—In compact green or yellowish tufts. Stems 2-4 cm. long, simple or dichotomous, covered below with ferruginous tomentum. Leaves erecto-patent or subsecund above when moist, flexuous and somewhat crispate when dry, oblong-lanceolate, long narrowed-acuminate, generally somewhat inflexed at margins, subcanaliculate, smooth or papillose at back, serrulate above, 4-6 mm. long, .75-1 mm. broad: costa percurrent or excurrent, generally papillose and denticulate at back above, sometimes nearly smooth. Cells of the areolation short, angular, irregular in the upper part, linear, elongated toward the base, the alar large, lax, quadrate or subhexagonal, orange-brown. External perichætial bracts from a broad base suddenly constricted into a more or less elongated denticulate point, the inner convolute, sheathing, abruptly subulate from the rounded apex. Pedicel yellowish, 20-25 mm. long. Capsule

[1] Provisional diagnoses of most of the following mosses have been issued in *Revue Bryologique*, 1888, no. 5.

pale, cernuous or suberect, oblong or subcylindrical, arcuate, slightly plicate when old, with a small strumose neck. Lid conic, with a long subulate beak. Annulus distinct, teeth purple, cleft to the middle or below into 2-3 quite free or often more or less coherent legs.

D. pallidum BS. *Bryol. Eur.* mem., non C. Müller *Syn.* I, 359, nec plurim. auct. *D. spurium* var. *condensatum* Lesq. et James, *Manual* 76, non *D. condensatum* Hedw. *D. arenarium* Ren. et Card. mss. in litt. et sched.

"In arenosis siccis meridionalibus." (Sull. and Lesq. *Musci bor. Amer. exsicc.*) "In dry sandy places on hills, especially in southern districts." (Lesq. and James, *Manual*, 76.) We have this plant from Florida (*Fitzgerald*, *Sawyer*), Louisiana (*Langlois*) and Carolina (*H. A. Green*). Probably in all the southern states.

Since the establishment of our species in the *Revue Bryologique*, we ascertained from the examination of two authentic specimens of *D. pallidum* BS., in the herbarium of the Botanical Garden of Brussels, that this plant, only mentioned by the authors of the *Bryologia Europæa* as a species closely resembling in habit the *D. Muhlenbeckii* BS., is identical with the *D. spurium* var. *condensatum* of the American bryologists, from which we have made our *D. sabuletorum*. Therefore, the name of *D. pallidum* BS. should be retained by right of priority. But, as Müller, in his *Synopsis*, described erroneously under the name of *D. pallidum* BS. a form of *D. scoparium*, and as it is generally this form which is known in the current literature as *D. pallidum*, it seems to us to be most convenient to adopt a name about which there can be no mistake, and therefore we retain our name of *D. sabuletorum*.

This species is intermediate between the *D. spurium* Hedw. and the *D. Muhlenbeckii* BS. and *D. brevifolium* Lindb., differing from the first in its much narrower and not undulate leaves, and from the last two species in the form of its perichætial bracts, and the thinner walls of the cells of its leaves.

Dicranum scoparium Hedw. var. SULCATUM. (Florule de l'île Miquelon, 44.)—Differs from the typical form in the following characters: tufts yellowish; stems more slender: leaves often flexuous, erecto-patent or subsecund, narrower and more narrowly subulate, more sharply serrate above; cells of the areolation habitually destitute of chlorophyll, less

porose, rather thin-walled: pedicel pale yellow, more slender, sharply twisted: capsule pale, tawny, deeply sulcate when old, and provided with more distinct longitudinal bands of orange-colored, elongated, sinuous and thick-walled cells.

Miquelon Island (*Dr. Delamarc*).

By the pale tint of the tufts, pedicels and capsules, this remarkable variety, with rather the appearance of *D. longifolium*, belongs to the group of forms generally designated as *D. pallidum* C. Müll., or *D. scoparium* var. *pallidum*, but it is distinct by its narrower leaves, with a longer and more sharply serrate subula and its deeply sulcate capsule.

Dicranum Howellii.—In soft, rather silky, yellowish green tufts. Stems slender, erect, simple or dichotomous, tomentose below, 4–12 cm. long. Leaves not crowded, secund or erecto-patent, narrowly lanceolate, long subulate, nearly setaceous, serrate in the upper half, often slightly undulate when dry, 6–10 mm. long, .75–1 mm. broad at base: costa more or less serrate at back toward apex: cell-walls porose, but scarcely thickened. Inner perichætial bracts sheathing, rather suddenly narrowed into a long flexuous point, entire or coarsely sinuate at base of the subula. Pedicel pale, at last sharply twisted to the left, 25–35 mm. long; capsule rufescent, cylindraceous, arcuate, slightly plicate when old; lid with a long curved beak. Inflorescence monœcious or pseudo-monœcious: male flowers sessile, axillary, or set upon small, slender flexuous branchlets.

Oregon (*Th. Howell, L. F. Henderson*).

This plant is a remarkable form, belonging to the group of *D. scoparium*, of which it may be only a sub-species, but well characterized by the form of its perichætial bracts, narrowed at apex, and not abruptly subulate from the rounded apex, as is the case in *D. scoparium*. In habit and shape of the leaves it specially resembles the last variety.

Dicranum Miquelonense. (Florule de l'ile Miquelon, 42.)—In small, compact, yellowish green tufts. Stems dichotomous, radiculose below, 1–3 cm. long. Leaves small, short, erect-imbricate or slightly incurved, oblong-lanceolate, acute or obtuse, concave, entire or minutely sinuate-denticulate at apex, 2–3 mm. long, .50–.75 mm. broad; costa vanishing near the apex, smooth or scarcely rugose at back. Cells of the areolation smooth, small, short, quadrate or irregularly angular in the upper half, rectangular, 1–3 times longer than

broad, thin-walled toward the base, the alar lax, large, quadrate or subhexagonal, brown or yellowish. Fruit unknown.

Miquelon island, on ground and rocks (*Dr. Delamare*).

Rather resembling in habit the stunted forms of *D. elongatum* Schw. and *D. tenuinerve* Zett., but quite distinct by the form and areolation of the leaves. It has also some affinities with *D. flagellare* Hedw.

Fissidens incurvus Schw. var. BREVIFOLIUS.—Leaves broader and shorter; border of the vaginant lamina widening less at base.

Louisiana: on ground in woods near Baton Rouge (*Langlois.*)

TRICHODON FLEXIFOLIUS.—Loosely cespitose, green. Stems erect, simple, short, 2–5 mm. long. Lower leaves small, lanceolate-subulate, the upper larger, patulous, very flexuous, 3–4 mm. long, .35–.50 mm. broad, from an oblong base gradually narrowed into a long linear-subulate, canaliculate, subtubulose point, sinuate at the margins, toothed at apex, and with a broad costa, obscurely excurrent. Cells of the base rectangular, elongated, 2–4 times longer than broad, the others small, quadrate, very chlorophyllose, with transverse walls slightly prominent. Perichætial bracts similar to the leaves, but dilated and subsheathing at base: archegonia 2–4. Male flowers on the same plant below the female, small, gemmiform; perigonial bracts 4–5, the external broadly ovate, suddenly narrowed, cuspidate, the inner broadly and obtusely acuminate, obsoletely costate; antheridia 3–5, subsessile, elongated, with some paraphyses. Fruit unknown.

Florida: on sandy ground, near Beauclerc (*F. C. Sawyer*, 1887).

It is only by the examination of the fruit that we can be certain about the generic position of this species; however, by its vegetative system, it seems closely allied to *T. cylindricus* Sch., from which it differs in the monœcious inflorescence, the gradually narrowed leaves, and the shorter cells of the areolation.

Physcomitrium pyriforme Brid. var. LANGLOISII.—Characterized by the longer-acuminate leaves, the generally longer pedicel (15–20 mm.) and the asymmetrical calyptra, 2–5 lobate at base, but entirely cleft on one side.

Louisiana: Pointe-à-la-Hache, on ground in half-shaded places, growing with the typical form (*A. B. Langlois*). New Jersey: Atco (*H. A. Green*).

WEBERA CARDOTI Ren.—Loosely cespitose, pale green or yellowish. Stems simple, erect, slender, rigid and brittle. Leaves small, erect, imbricate, oblong-lanceolate, decurrent, strongly revolute on the borders, obtuse or subobtuse, rarely subacute, generally sinuate-denticulate at apex, 1–1.5 mm. long, .35–.50 mm. broad; costa very broad, green, percurrent or vanishing very near the apex, widening below and occupying one-third of leaf base. Areolation loose, cells truncate or subattenuate, 2–3 times longer than broad. Pedicel reddish, flexuous, often geniculate at base, 10–15 mm. long. Capsule oblong-subpyriform, symmetric, erect, yellowish or brownish, tapering to an attenuate neck, 2–2.5 mm. long, .35–.75 mm. broad; lid conic. Peristome small, pale yellow, pellucid, very minutely papillose; teeth triangular-lanceolate, long acuminate, provided with 15–25 lamellæ; inner peristome more or less perfect, with split segments and cilia, or reduced to a variously raised and lacerate membrane. Annulus of 2–3 rows of cells. Male plant distinct, smaller; flowers gemmiform, terminal.

Oregon: Mt. Hood, wet sandy rill-banks, growing with *Polytrichum sexangulare* Fl. (*L. F. Henderson*). Already kindly communicated in 1882 by Mr. L. Lesquereux, but likely from the same collector, who sent to us recently a large and very interesting collection of Pacific coast mosses, including several new species, which we are now describing and drawing for the BOTANICAL GAZETTE.

The *W. Cardoti* is allied to *Pohlia erecta* Lindb., from Norway, but this has the leaves plane on the borders, the costa less broad, vanishing far below the apex, the peristome reddish, etc. *W. commutata* Sch. is also somewhat related to our species, but is at first sight distinguishable from it by its drooping and broader capsule, the convex apiculate lid and the larger peristome.

BRYUM SAWYERI.—Loosely or densely cespitose, green or brownish. Stems short, 10–15 mm. long, radiculose below, branching by several innovations and more or less copiously provided in the upper part with brown, thick, simple, articulate and very caducous filaments, arising from the axils of the leaves. Leaves regularly distant or the upper tufted,

open when moist, erect-imbricate and often slightly twisted when dry, rather concave, oblong-subspatulate, narrowed at base, shortly acuminate, plane on the borders, obsoletely denticulate in the upper part, 2–2.5 mm. long, .5–1 mm. broad: costa percurrent or shortly excurrent. Areolation large, hexagonal, cells 2–4 times longer than broad, thin-walled: at the margins, 1 or 2 rows of narrow, elongated cells, but not forming a distinct border. External perichaetial bracts longer, more distinctly bordered, the 2 or 3 inner smaller. Pedicel reddish, 25–45 mm. long. Capsule brown or rufescent, pendent, finally oblique or subhorizontal, defluent into a long attenuate neck, constricted below the mouth after the fall of the convex-apiculate lid. Teeth of the peristome densely trabeculate; segments split; cilia long and appendiculate. The inflorescence seems to be dioecious, the male flowers being unknown.

Florida: Enterprise, on sandy ground and at base of trees (*Fitzgerald*), Beauclerc, on decayed logs (*F. C. Sawyer*). Louisiana: Pointe-à-la-Hache, on wall (*A. B. Langlois*).

This species is readily distinguished from B. capillare, to which it is nearly allied, by its leaves plane on the margins and without distinct border. The brown articulate filaments, which arise from the axils of the leaves and perhaps help the propagation of this moss, are generally very copious on sterile specimens, while they are rare or even wanting on the fertile plant.

Fontinalis antipyretica L. var. Oreganensis.—A remarkable form, with very slender, soft, pinnate stems, yellowish and shining above, not naked below. Stem-leaves distant, open, lanceolate. Branches cuspidate. Branch-leaves erect, imbricate at the top of the branches. Cells of the areolation very long and narrow.

Oregon: top of Coast mountains, in swamps, on the roots of trees. (*Th. Howell*).

Fontinalis Delamarei.—Dull green, stems 15–30 cm. long, naked below, much divided: branches irregularly pinnate, branches erecto-patent, attenuate. Leaves crowded, erect, loosely imbricate, oblong-lanceolate, obtusely acuminate, concave, not keeled, slightly incurved on the borders, 3–4 mm. long, .75–1.25 mm. broad. Cells of the areolation linear-elongated, sometimes rather flexuose, the alar few,

small, subhexagonal. Perichætial bracts often lacerate at the rounded apex. Capsule immersed, oblong-subcylindrical, 2 mm. long, .75 mm. broad: lid conic-acuminate. Teeth of the peristome about .50 mm. long, narrowly linear-acuminate, with 14–20 lamellæ; divisural line distinct at the base only and not perforated. Cilia of the inner peristome united at apex only, the lower transverse bars imperfect, papillose, not appendiculate. Diameter of the spores .025–.028 mm.

On stones in the rivulets of Miquelon island, copiously fruiting (*Dr. Delamare*).—In our work on the flora of the Miquelon island,[2] we indicated this moss as *F. squamosa* L. At that time we knew the plant only from sterile specimens, and in this state it is almost impossible to distinguish it from F. squamosa.

The F. Delamarei is perhaps a sub-species of F. squamosa: it is intermediate between this species and *F. Novæ-Angliæ* Sull., resembling the first by the characters of the vegetative system, and related to the second by the organs of fructification, as far as we can judge from the tab. 65 of the Sullivant's Icones. The original, but sterile specimen of this last species, for which we are indebted to the kindness of our venerable friend, Mr. Lesquereux, differs from our plant in the more slender stems, pinnately branched at right-angles, and in the leaves more distant, not imbricate, characters which give to the plant quite a different facies.

The true *F. squamosa* L., not yet recorded from America, differs from *F. Delamarei* in the following characters: capsule twice as large, ovoid or ovate-oblong, rounded at base: teeth of the peristome twice as long (about 1 mm.), more strongly papillose, more densely trabeculate (26–32 lamellæ): divisural line more distinct and often perforated toward the base; inner peristome perfectly latticed: spores generally a little larger (.028–.031 mm.).

Alsia Californica Sull. var. FLAGELLIFERA.—More slender than the type, with numerous filiform, flagellate branchlets, covered with very small lanceolate leaves.

California: Monterey, on trees (*Miss Martha R. Mann*).

Eurhynchium strigosum BS. var. BARNESI.—Differs from the European type in the stems rather more robust, the stem-leaves larger, longer acuminate, the branch-leaves more

[2] Florule de l'île Miquelon, Lyon, 1888.

elongated, obtuse or subacute, and the capsule shorter, broadly ovate.

Idaho: Lake Pend d'Oreille, on logs (*Leiberg*, communicated by Mr. Ch. R. Barnes).

Eurhynchium strigosum BS. var. FALLAX.—Formrobust, resembling in habit E. myosuroides. Stem-leaves very large, triangular-lanceolate, obtuse; branch-leaves rounded at apex. Capsule like that of the typical form.

Idaho, with the preceding.

The type from Europe has the stem-leaves ovate-triangular, suddenly narrowed-acuminate, the branch-leaves lanceeolate, acute or subobtuse and the capsule oblong. It rather resembles in habit E. prælongum or E. Stokesii. This typical form, like the two vars. Barnesi and fallax, has the leaves distant, open or erecto-patent. The forms belonging to the var. *præcox* Wahl. and *diversifolium* Lindb. (*E. diversifolium* BS.)., and which are, at least in Europe, the most widely distributed, have quite a distinct facies, by their concave and closely imbricate leaves and their cylindrical julaceous branches. These forms, which in Europe occur only in alpine and subalpine districts, are met with in low countries of the United States, as the E. diversifolium issued in the *Musci bor. Amer. exsicc.* no. 432 was collected, according to the label, in the hills of Ohio. We have it also from Montana, near Helena (*F. W. Anderson*, communicated by Mr. Ch. R. Barnes).

Plagiothecium denticulatum BS. var. MICROCARPUM.—Differs from the type in its very short and turgid capsule, scarcely 1.5 mm. long, and the thick, flexuous pedicel, often geniculate at base.

Idaho: Kootenai county (*Leiberg*: kindly communicated by Mr. Ch. R. Barnes).

Amblystegium riparium BS. var. SERRATUM.—Plant slender, creeping. Leaves narrow, serrulate at apex.

Kansas: Saline county, roots of trees (*Joseph Henry*).

Amblystegium riparium BS. var. FLORIDANUM.—Very small, appressed. Leaves small, narrowly lanceolate, long acuminate, entire. Capsules short, scarcely 1-1.5 mm. long, arcuate.

On logs, rotten wood, roots and base of trees. Florida (*Garber*). Louisiana, Lafayette's woods (*Langlois*).

HYPNUM SYMMETRICUM.—This plant is a subspecies of *H. uncinatum* Hedw., from which it differs in the less strongly and less regularly plicate leaves, entire or very slightly denticulate, and chiefly in the narrower, erect and quite symmetric capsules, sometimes clustered by two in the same perichætium.

Oregon: On ground, in damp woods (*Th. Howell*). Idaho: Lake Pend d' Oreille, on logs (*Leiberg;* kindly communicated by Mr. Ch. R. Barnes).

Hypnum arcuatum Lindb. var. AMERICANUM (Florule de l' ile Miquelon, 56).—Differs from the typical form in the stems, slender, prostrate, more or less distinctly pinnate and the leaves smaller, with the acumen shorter and broader, blunt and usually denticulate at apex.

Decayed wood and sandy ground. Louisiana: Baton-Rouge, Pointe-à-la-Hache, Riviere-aux-Cannes (*Langlois*).

The type has been collected at Bethlehem, Pa., by E. A. Rau, and the var. *demissum* Sch. near Baltimore by Fitzgerald. This species has been confounded with *H. curvifolium* Hedw., from which it is easily distinguished by the alar leaf-cells, lax, inflated, hyaline and forming distinct auricles.

We will indicate here several species not previously recorded from North America:

Eucladium verticillatum BS.—California: Santa Ana Cañon (*Sam. B. Parish*, kindly communicated by Miss Clara E. Cummings).

Dicranum tenuinerve Zett.—Miquelon island (*Dr. Delamare*).

Fissidens Bambergeri Sch.—Kansas: Saline county (*Joseph Henry*). Louisiana: Point-à-la-Hache (*Langlois*).

Fissidens viridulus Wahl.—Louisiana: St. Martinsville (*Langlois*). Probably confounded with *F. incurvus* Schw.

Trichostomum nitidum Sch.—United States, without locality, collected by *James*, communicated by Mr. Beschereller.

Bryum microstegium Sch.—Labrador (*Freeman*).

Polytrichum sexangulare Fl.—Oregon: Mt. Hood, sterile (*Henderson*).

Amblystegium porphyrrhizum Lindl.—Miquelon island (*Dr. Delamare*). Kansas: Saline county (*Joseph Henry*).

Amblystegium Kochii BS.—Kansas: Saline county (*Joseph Henry*).

Hypnum Vaucheri Lesq.—Montana: near Helena (*Anderson*, communicated by Mr. Ch. R. Barnes). This species is allied to *H. cupressiforme* L., is quite distinct from the H. Vaucheri of the Manual, p. 414, which is an Eurhynchium (*E. Vaucheri* BS., *Hypnum Tommasinii* Sendtn.).

In Kindberg's *Enumeratio muscorum qui in Groenlandia, Islandia et Faroer occurrunt* (1888), are indicated many species which are not described in the Manual of Lesquereux and James.

Monaco, and Stenay, France.

EXPLANATION OF PLATES XII–XIV.—All figures enlarged more than 15 diameters are copied by means of Nachet's camera lucida.

Plate XII. A. Dicranum sabuletorum. *a a*, entire plant; *b b*, leaves; *c c c*, point of same; *d*, basal areolation; *e*, areolation of the upper part; *f*, external perichætial bract; *g*, inner perichætial bract; *h*, point of same; *i*, capsule and lid.—B. Dicranum Howellii. *a a*, entire plant; *b*, leaves; *c*, perichætial bract; *d*, ditto of D. scoparium.—C. Dicranum scoparium var. sulcatum. *a*, point of a leaf; *b*, capsule; *c*, portion of the capsular membrane, showing the areolation of a longitudinal band.—D. Dicranum Miquelonense. *a*, entire plant; *b b b*, leaves; *c*, point of same; *d*, areolation of the base; *e*, areolation of the upper part.

Plate XIII. A. Trichodon flexifolius. *a*, entire plant; *b*, lower leaf; *c*, upper leaves; *d*, areolation of the base of same; *e*, areolation of the upper part of same; *f*, transverse section of same; *g*, point of same; *h*, perichætial bract; *i*, external perigonial bract; *j*, inner perigonial bracts, showing the antheridia by transparence.—B. Webera Cardoti. *a*, entire female plant; *b*, male plant; *c*, leaves; *d*, areolation of the middle; *e*, areolation on the borders; *f*, capsule; *g*, the same, deoperculate; *h*, portion of the peristome.—C. Bryum Sawyeri. *a*, entire plant; *b b*, leaves; *c*, point of same; *d*, areolation of same; *e*, axillary filaments; *f*, capsule.

Plate XIV. A. Fontinalis Delamarei and F. squamosa. *a*, leaf of F. Delamarei; *b*, capsules of the same; *b'*, capsule of F. squamosa; *c*, teeth of the peristome of F. Delamarei; *c'*, ditto of F. squamosa; *d*, portion of a tooth toward the base, F. Delamarei; *d'*, ditto F. squamosa; *e*, portion of the inner peristome of F. Delamarei; *e'*, ditto of F. squamosa; *f*, calyptra of F. Delamarei.—B. Eurhynchium strigosum. *a*, stem-leaf of the European type; *b b*, branch-leaves of the same; *c*, capsule of the same; *a'*, stem-leaf of var. Barnesi; *b b'*, branch-leaves of the same; *c'*, capsule of the same; *a''*, stem-leaf of var. fallax; *b'' b''*, branch leaves of the same. C. Hypnum symmetricum. *a*, entire plant; *b b*, leaves; *c*, capsules.

Histology of the leaf of Taxodium. II.

STANLEY COULTER.

(WITH PLATE XI.)

II. The Mesophyll.—The parenchyma of the mesophyll consists of large, irregular, polyhedral cells, characterized by exceedingly thin walls and numerous infoldings. These infoldings are usually filiform, although in some instances they are somewhat thickened; in others, bifid; in others, terminated by a knob. Those cells nearest the epidermis and the fibro-vascular bundle have, as a rule, the more numerous and prominent infoldings. Scattered throughout this tissue are found the so-called "strengthening cells" (sclerenchymatous), either in groups or singly. They seem to be arranged according to definite plan, as in the foliage leaf of Pinus[10] and the fruit of the Umbelliferæ[11], but may be found in almost any part of the leaf. Sections from different leaves rarely show the same arrangement, and the same holds true of sections from different parts of the same leaf. They may, however, be expected in transverse section with a reasonable degree of certainty in two positions, (1) directly over the fibro-vascular bundle, immediately adjoining the epidermal cells of the outer surface of the leaf, and (2) near the ends of the leaf in its longer diameter. In the first case, they usually occur in groups of from 5–20, either massed or arranged in irregular rows, in which arrangement they often resemble a series of braces for the purpose of support (fig. 4). In the second case, they may appear singly, as a row stretching from the epidermal cells of the outer to those of the inner surface, or as a row running back from the apical cell, in or parallel to the line of the greater diameter of the leaf (fig. 5).

It rarely occurs that in this position these cells are more than three in number, or that they occur otherwise than in a straight line. It sometimes happens that these cells are entirely absent from this region (fig. 3), but this is not frequently the case.

Groups composed of from three to five cells, rarely more, are also found about midway between the epidermis and the fibro-vascular bundle, although these are sometimes wanting. It often happens that one-half of the leaf will be well supplied with these cells, while the other has only one or two.

[10] Coulter and Rose, BOTANICAL GAZETTE, xi. 258.
[11] Op. cit., xii. 239.

sometimes none. Although following closely no rule, they may roughly be said to occur, if at all, either in a hypodermal layer or layers immediately beneath the epidermis, or in a line about midway between the epidermis and bundle, but never, in either case, forming a continuous ring. In no case in the sections observed have they been found adjoining the bundle. It must be remarked, however, that they are not always found in the positions mentioned, but if present in relatively large numbers, the great proportion of them may be so referred. Apart from these general regions, single cells are found in almost every conceivable position, except adjoining the bundle. They are often found adjoining the respiratory cavities, more often in positions which indicate nothing concerning their function or their relationship to the other leaf tissues.

In transverse section they show the heavily thickened wall and present the peculiar appearance of "fullness," so marked in the case of this tissue in Pinus (figs. 3, 4 and 5).

In longitudinal section they are seen to be elongated prisms with pointed ends (fig. 10), and have the fibrous, banded appearance characteristic of these cells.

Comparing the development of this "strengthening apparatus" of Taxodium with that of Pinus, in which the location of these cells furnishes valuable diagnostic marks,[12] it appears to present the incipient stages of a system which in other sections of the same order becomes highly differentiated. In the imperfect annular arrangement of its strengthening tissue, Taxodium seems to be allied to Taxus on the one hand, and to Abies on the other, and in fact follows the prevailing rule that obtains in most leathery leaves.[13]

In Taxodium, the strengthening cells of the sclerenchymatous type do not surround the resin duct, or even necessarily appear in its region, its support apparently coming from collenchymatous cells, which here at least seem a transition form between the parenchyma and sclerenchyma.

In Pinus, on the contrary, the sclerenchymatous strengthening tissue seems to reach its highest development in its annular investment of the resin ducts, an investment which in Pinus sylvestris is in every instance complete and in some cases consists of two layers (cf. figs. 11, 12 and 13).

The strengthening apparatus of Taxodium distichum differs therefore from that of Pinus sylvestris in the following particulars: (1) In the absence of the continuous hypoder-

[12] Coulter and Rose, BOTANICAL GAZETTE, xi. 258.
[13] De Bary, Comp. Anat. of Phan. and Ferns, 119.

mal layer, which in Pinus seems collenchymatous rather than sclerenchymatous; (2) in the presence of this tissue in the median region between the epidermis and bundle; (3) in its absence at the resin duct; (4) in their indeterminate position.

In fact, so widely variant is the system in Taxodium itself, that it is only through an examination of some hundreds of sections that even an approximate disposition is to be found.

So far, therefore, as the strengthening apparatus is concerned, the leaf of Taxodium seems much less perfectly developed than that of Pinus.

Between the bundle and the epidermis of the lower leaf surface, relatively close to the latter, is found the single resin duct. The position is that to be expected from the nature of the leaf as shown by Thomas in Vergl. Anat. der Coniferenlaubblätter. No accessory passages are found in any other portion of the leaf. In transverse section the duct is seen to be somewhat irregular in outline, more nearly polyhedral than circular. The bounding cells, as above said, seem to be collenchymatous, and differ only in their thickening from the surrounding parenchyma. Those cells lying between the epidermis and the duct are the most heavily thickened, and by their arrangement furnish not only support but protection.

On the upper side of the duct the collenchymatous cells shade down gradually as to thickness of wall, until they reach the bundle. The duct thus seems to be perfectly supported and protected in the vertical line.

No marked extension of the thick-walled bounding cells is to be found laterally; they seem in that direction to pass somewhat abruptly into the typical parenchyma of the mesophyll (figs. 4 and 11).

The secretory cells of the duct, generally six in number, show in transverse section a marked difference in size and form. In size, they often differ as four or five to one, while their forms range from irregularly triangular, through narrowly elliptical to oval (fig. 11).

In median longitudinal section they are seen to have their longest diameter in the direction of the duct, while the bounding cells, which show numerous infoldings, have a relatively similar arrangement (fig. 10). The walls of the secretory cells are extremely thin and delicate, showing no thickening in any direction.

No tests were made to determine the nature of the con-

tents of the cells, and they are classed among the resin secreting cells because of their similarity in structure and arrangement to the typical resin ducts, and the close relationship of Taxodium to resin secreting plants.

The resin duct of Taxodium, when compared with the secretory system of Pinus sylvestris, appears remarkably rudimentary. Leaving out of view the greater number of ducts found in Pinus, a comparison of the duct of Taxodium with a single duct of Pinus confirms us in the thought that we have in the former the beginnings of a system, which is fully and strikingly developed in the latter. In Pinus we find in transverse section the almost perfectly circular outline of the duct, the sclerenchymatous investing ring at times of double thickness, the more numerous and regular secretory cells often of more than one layer, evidencing in every case a complete differentiation from the surrounding tissues, and an apparently perfected system.

In Taxodium, on the contrary, the whole duct gives evidence of an incomplete differentiation. It agrees more nearly in every particular with the duct of Pinus sylvestris as found at the commencement of its development in the young leaf (cf. figs. 11 and 12).

In this system, then, as well as in the cases of the stomata and the strengthening cell system, the leaf of Taxodium gives evidence of a much less complete development than that of Pinus.

III. Fibro-vascular system.—The fibro-vascular bundle[14] follows the general rule which obtains among the Coniferæ in having a separate course and free end, and also accords with the condition, so far as it has been investigated, among the Cupressineæ, in being single and median. While the bundle, which is of the collateral type, in transverse section, at first glance, seems to stand out sharply and distinctly, it is a matter of some difficulty to assign to it a definite limit, there being no bundle sheath and the parenchymatous elements of the surrounding tissues passing gradually into those which lie within the bundle itself. The orientation of the bundle is normal. Toward the end it is tapered somewhat, though not sharply. The xylem, which is irregularly semi-crescentic in shape, diminishes as it extends toward the upper leaf surface, until at its limit it consists of but two or three rows of tracheides. These, however, are in immediate contact with

[14] Geyler, Gefässbundelverlauf in d. Laubblattregion d. Coniferen, Pringsheim's Jahrb. VI., 55; Thomas, in Pringsheim's Jahrb. IV., 43; Cf. also, de Bary, Comp. Anat. of Phan. and Ferns, 300.

a series of heavily thickened cells, apparently collenchymatous, by which the bundle seems to be directly connected with the group of hypodermal sclerenchymatous cells heretofore described.

The xylem also diminishes laterally in the same manner, and is connected on either hand with an irregularly curved line of tracheides which project into the surrounding parenchyma. The line of the "fringe of tracheides," if indeed it can be called a fringe, can not be said to follow the contour of the leaf. In many cases it terminates abruptly, although in one or two instances in the sections made it was a prominent feature. Its presence, however, was not so constant, nor so marked, as might have been expected from the studies of Frank[15], and later those of Mohl[16]. In other respects the xylem seems in no wise different from that usually found in collateral bundles among gymnosperms.

The phloem, which shows regular rows of similar elements, in all the sections examined, seemed to have thicker walls than were to be expected in this section, but it is probable that the apparent thickness was due to swelling. In spite, however, of this somewhat unusual thickness of the membranes of the phloem, the boundaries between it and the xylem are sharp and distinct.

The phloem, as the xylem, diminishes somewhat laterally, and aids in giving the pointed appearance to the bundle in cross section.

As the xylem is connected by a series of thickened cells to the sclerenchymatous strengthening cells above it, so the phloem is connected with the resin duct by a number of rows of thick-walled cells, and thence by way of the collenchyma surrounding the duct, to that lying between the duct and the epidermis. In the vertical line from the phloem to the duct and thence to the lower leaf surface, the thickness of the cell walls seem unchanged, but in all other directions they diminish somewhat rapidly until they pass into the surrounding parenchyma. It is, as stated at the first, extremely difficult to say where the bundle ends, and the non-equivalent elements of the same form begin (figs. 4 and 2).

In longitudinal vertical section, the elements of the bundle present no marked features unless it be in the absence of spiral vessels, which were not detected in any of the sections made. I am not as yet prepared to say that they do not oc-

[15] Botan. Zeitung, 1864, p. 167.
[16] Ibid, 1870, p. 10.

cur, but they certainly are not so prominent or numerous as in Pinus and the other Coniferæ studied (fig. 10).

While the bundle is single and median, it has in some measure the appearance of having been formed by the coalescence of two bundles. If this be true, the coalescence occurs in the node, or immediately at the attachment of the leaf to the branch. Careful sectioning of the entire leaf failed to demonstrate the fact. In the work, I have as yet been unable to secure satisfactory sections either through the node, or through the exact base of the leaf. The point is therefore undetermined, with the probabilities, however, strongly against the view of the bundle being the result of a coalescence of two bundles.

The space occupied by the bundle, as compared with the other tissue systems making up the leaf structure, is smaller than is usually the case in conifers, much smaller than in Pinus sylvestris.

In comparing the fibro-vascular systems of Taxodium and Pinus, we find, as in the case of the other parts compared, a much less sharp differentiation from the non-equivalent surrounding elements, as well as a less complete development of the composing elements (cf. figs. 2 and 4 with fig. 13). It may therefore be safely concluded that, so far as leaf structure is concerned, Taxodium distichum presents a much less complete development and a much lessperfect differentiation of systems than is found in Pinus sylvestris. The facts in support of this view may be summarized thus:

1. In the less perfect mechanism of the stomata, evidenced by (a) the character of the guard cells, and (b) the slight modification of the subsidiary cells.

2. In the imperfect development and indefinite arrangement of the strengthening apparatus, shown by (a), the absence of the continuous hypodermal layer, (b) the absence of sclerenchyma from the region of the resin duct, and (c) the presence of single cells and groups of cells of this tissue, at indeterminal points in the mesophyll, referable to no theory of support.

3. In the presence of a single resin duct, showing (a) less regularity of form, (b) few and irregular secreting cells, and (c) imperfect differentiation from the surrounding tissues.

4. In the less complete differentiation of the bundle and the less perfect development of the elements composing it.

In all of these particulars, indeed, it more nearly resembles the conditions found in the young foliage leaf of Pinus

sylvestris than in the adult leaf. It may, therefore, be fairly regarded as showing the beginnings of a series of mechanisms and systems which in Pinus sylvestris have reached a high development. In Taxodium we find these variant in form, in position, in development; in Pinus, constant in all these particulars.

Purdue University, Lafayette, Ind.

EXPLANATION OF PLATE XI.—The magnification figures were upon the original drawings. These having been reduced one-half, the magnification figures must be correspondingly reduced.

Fig. 1. A. Single leaf of T. distichum in position. B. Leafy branchlet, with its crowded, 2-ranked, linear leaves.

Fig. 2. Cross section of leaf of T. distichum, showing the three regions of which the leaf is composed, distribution of strengthening cells, and position of resin duct.

Figs. 3, 4, and 5. Same, more highly magnified, showing also distribution of stomata. The three figures, as can be readily seen, are parts of the same section.

Fig. 6. Surface slice of T. distichum, showing irregular outlines of epidermal cells and depressed position of stomata.

Fig. 7. Section of stoma of T. distichum, showing depressed position, oval guard cells with heavily thickened outer walls, and large respiratory cavity.

Fig. 8. (Letter press, p. 80) Section of stoma of Pinus sylvestris.

Fig. 9. Longitudinal section, leaf of T. distichum, showing formation of apex of leaf by a continuation of epidermal cells of inner surface and modification of adjacent cells.

Fig. 10. Median vertical longitudinal section, leaf of T. distichum. *s*, superior surface; *i*, inferior surface; *st*, strengthening cells; *r*, resin duct.

Fig. 11. Resin duct of T. distichum, showing imperfect differentiation from surrounding tissues and irregular thin-walled secretory cells.

Fig. 12. Resin ducts of Pinus sylvestris.

Fig. 13. Transverse section of foliage leaf of Pinus sylvestris, showing the three leaf regions, distribution of strengthening cells and position of resin ducts.

BRIEFER ARTICLES.

A modification of the versatile anther.—In the genus Lilium, for example, it is a well-known fact that the anthers are at first erect, but as they mature the true versatile character becomes evident. An inspection of a young anther shows that the upper portion of the filament is slender, and inserted, or held in position, between the two lobes of the

anther. A little force applied in the right direction will cause this small and somewhat tapering portion of the filament to leave the canal, and the heavy anther is then suspended at the middle by the tip of the filament. By careful manipulation the original position can be restored and the anther is again upright. The release of filament takes place naturally as the two lobes dehisce and separate from each other.

In a very closely related genus, namely Tulipa, the stamens are also large, but the anthers remain upright throughout their whole existence. When the tulip stamen matures and the pollen is exposed along the two sutures, the flat anther has a twist in it so that the widest diameter at the tip stands at right angles to that of the base. Owing to its large size, its breadth and narrowness, and peculiar attachment to the filament, the anther may be turned upon its long axis by any slight breeze or by the bodies of visiting insects. This attachment is a long pivot which extends upward in the center of the anther for a distance and is held in place by tough fibres at its tip. So elastic is this tip that the anther may be turned several times upon its long axis before it will become detached from the hard peg-like extremity of the filament.

The structure for facilitating the dispersion of pollen in the tulip anther is not unlike what it would be in the lily if, instead of becoming strictly versatile, the filament tip was continued in its "pocket" and the anther was free to turn upon this upright point.—Byron D. Halsted, *Rutgers College.*

The winter leaves of Corydalis glauca and C. flavula.—Says Curtis (*Bot. Magazine*, 1792) referring to the Linnæan *Fumaria sempervirens*: "The term *sempervirens* originated in the description of it given by Cornutus (*Fumaria siliquosa sempervirens* Cat. Canad. 57 t. 57); the impropriety of calling an annual plant an *evergreen* has appeared to us too glaring to be continued; we have thought the promotion of science required a change in the name, and have therefore altered it to that of *glauca*." When Pursh removed the plant to *Corydalis* he made it *Corydalis glauca*. As an author who places an old species in a new genus is not bound under the canons to retain the old name, it may be in order for those who sympathize with Curtis's reasons for changing the Linnæan name to give it another, for *glauca* is no more characteristic than *sempervirens*. Certainly some forms of *C. aurea*, especially Rocky Mountain forms, are more glaucous than forms of *C. glauca* ever are. If we may change names because they are not in accord with the terms used in describing the plant, how will the list of synonyms swell!

The object of this note is to suggest whether, after all, Cornutus might not have more reason than Curtis supposed for using the term *sempervirens* in connection with this plant. Last January I spent the greater part of a day among the pine-crowned hills of the Allegheny range, near Lewistown in Central Pennsylvania. It had not been much

below the freezing point at night, and the day was a pleasant one for studying the root-leaves of plants—to me an interesting department of phytology. It was a pleasure to discover a new Pennsylvania locality for *Pinus pungens*, but a much greater was furnished by a complete carpet of glaucous green leaves of a *Corydalis*, spread over the moss-covered mass of rotting pine needles under the trees. As the allies of the plant, as known to our botanical grandfathers, died completely down in winter, why should it be wondered at, and made censurable, that such a plant should be dubbed evergreen?

Taking a few plants home and subsequently flowering them, it proved to be *Corydalis flavula* of DC. (*Fumaria flavula* Rafinesque). I have never met *C. glauca* in winter excursions, but its near relationship to this species would justify some faith in Cornutus having seen something similar suggestive of the name.

C. flavula is certainly an annual in the sense of germinating and dying within a twelve month, but in the sense some use the term biennial, that is, getting considerable strength in the autumn after germinating early in the season, and then remaining over to the next to finish its growth and mature, it would not be an annual in Curtis's estimation, nor probably would *C. glauca* be in its native wilds.—THOMAS MEEHAN, *Germantown, Pennsylvania.*

Pollen mother-cells.—If any person has experienced difficulty in obtaining pollen mother-cells in excellent condition for study, their attention is called to the young anthers of *Negundo aceroides* Moench. Sections of thecæ may be easily obtained by cutting across the staminate flowers before they have attained half their full size. When these sections are not too thin the thecæ will be found made up of a single whorl or circle of mother-cells, many of which are pear-shaped, due to unequal pressure. The mother-cells in the center of the thecæ easily become detached and may be found scattered through the liquid in which the sections are immersed. These loose cells have a strong resemblance to the asci of the Erysipheæ (powdery mildews), and the four pollen grains may be found in all stages of development. In the beginning there is only the slightest differentiation of the protoplasm into four indistinct masses. As they become more manifest the arrangement of the four is found inconstant. Sometimes they are placed with their longer diameter parallel like the four nutlets in a borrage fruit. In others two are in the same plane and the other two above or below, and at right angles to the first pair. Azorubin is excellent in weak solution for bringing out the young grains more prominently. The pollen grains do not use up the thick mother wall, and leave pits or cavities as they escape, as young seeds in a wax-bean pod.—BYRON D. HALSTED, *Rutgers College.*

CURRENT LITERATURE.

Revision of Umbelliferæ.[1]

Botanists everywhere, and American botanists especially, owe a large debt of gratitude to Professors Coulter and Rose for the above work, now issued in its completed form. No order of our plants has been more difficult or was in greater confusion; and this, of late years, had been vastly increased by the many and often incomplete specimens of new far western species. The authors, at the beginning of their labors, wisely determined to study the better known and less difficult species of the eastern states first. The revision of these was completed and issued in 1887, and to it was appended an excellent paper on the "Development of the Umbellifer fruit." In the present issue is given a brief "Historical Sketch" of the bibliography of the subject and a good account of the geographical distribution of the species, with a statistical table appended. The vegetative organs, the inflorescence and the flower then receive attention, and then follows the final result of their studies of the fruit and its development. This introduction, as it were, to the systematic portion, closes with some notice of the "characters used in classification," and some pertinent "directions for collection and study." The first is especially interesting because of our authors' low estimate of the oil-tubes of the fruit as a divisional character. They do not use it in the primary divisions and even in the subdivisions it is put almost last in diagnostic importance The "strengthening cells" under the ribs of the fruit of many species also receives marked and deserved attention.

Next comes the "Systematic Synopsis of the Genera" (with an "Artificial Key to the Genera"), and the "Systematic Synopsis of the Species." The former begins with the Caucalineæ, thus reversing the usual order. The first series comprises those genera, the fruit of which have the secondary ribs most prominent; but as this contains but 5 of the 59 genera and only as many species, it is the arrangement of the second series containing the remainder of the genera (those having the fruit with primary ribs only) which principally concerns us. The primary divisions are three; those genera whose fruit is strongly flattened dorsally (17), those whose fruit is not flattened at all or but slightly (11), and those with laterally flattened fruit (31). The relative strength is better shown by saying that of indigenous species the first division contains 87, the second 35, and the third 91. This arrangement leaves the sequence of genera much as we are accustomed to see it, except as before stated—a notable exception being the placing of Erigenia next to Hydrocotyle. There are 5 new genera, and 3 other genera, not heretofore recognized as represented in our flora, are admitted.

[1] COULTER, JOHN M., AND ROSE, J. N.—Revision of North American Umbelliferæ. 8 vo. pp. 144, with nine plates. Crawfordsville, Ind. December, 1888. $1.00.

In the "Synopsis of Species" is found the same careful and discriminating work. Following Bentham and Hooker, Archangelica is merged in Angelica, which contains sixteen species. *Archangelica Gmelini* DC. of the northern coasts becomes *Coloplcurum Gmelini* Led. The Colorado plant, so named, becomes *Selinum Grayi*, and this genus of seven species also includes those specimens from the northwest formerly referred to *Conioselinum Fischeri*, here divided between *S. Benthami* Wats. and *S. Hookeri* Wats. Conioselinum is again restored for *C. Canadense* T. & G. Tiedemannia is restored and includes Archemora, which thus disappears from our flora; in this the author's views are doubtless correct, as they are also in separating this genus (and Pastinaca) from Peucedanum, to which Bentham and Hooker joined them. A new genus, *Coloptera*, is formed by bringing together three species which have been variously referred to Cymopterus, Ferula and Leptotænia. To the last-named genus are again referred the species removed to Ferula by Drs. Gray and Watson, and this name also disappears. The dominating genus is Peucedanum, now increased to forty-three species, all belonging to the trans-Mississippi region. Of these the authors have contributed fourteen. In these nearly allied and somewhat difficult genera there is room for difference of opinion, but we apprehend that our authors have done very much to settle the proper relations of the genera and species. Other interesting new genera are *Pseudocymopterus*, a good genus containing *Thaspium? montanum* Gray and two species formerly referred to Cymopterus; *Museniopsis* for *Tauschia Texana* Gray; *Harbouria* instituted for *Thaspium trachypleurum* Gray; and *Aletes*, also of a single species, which has a most curious history, well illustrating the former confusion of the order. *Oreoxis humilis* Raf. takes the place of *Cymopterus alpinus* Gray. *Podistera Nevadensis* Watson is retained for *Cymopterus Nevadensis* Gray. Eulophus is taken to include *Podosciadium* Gray. Our only native Bupleurum is well separated from *B. ranunculoides* L. under the name of *B. Americanum*. *Velaea* DC. is again separated from Arracacia and the species of Deweya are merged in it, and the name which commemorated the labors of a worthy botanist is dropped.

An admirable feature of this part of the work is to be found in the clear diagnostic notes in which the authors give their reasons for the formation of new genera or the re-arrangement of the species.

The excellent figures of cross-sections of the fruit are placed at the end of the work. There is also a good index, which is curiously interposed between the "list of figures" and the figures themselves.

This work, the authors say, is the result of "some four years of unremitting study." It has been time well spent for their own fame as well as for the advantage of botanists at large. They have brought to their work improved methods of study instead of relying wholly upon external characters, and have thereby advanced the grade and standing of systematic botany.—Wm. M. Canby.

Development of Pilularia.[2]

In undertaking the study of this interesting plant Dr. Campbell had in view two things, viz.: the investigation of its life-history, and the determination how far the parrafin imbedding-process was of practical application in the study of vegetable embryology. The method of imbedding was found eminently successful, and, as a consequence, the life-history of Pilularia is worked out as it never has been before. The material was kept in constant germination and the investigation was a most exhaustive one. The subject is treated under the following captions: the microspores and male prothallium, the macrospore and female prothallium, the embryo, the leaf, the root-quadrant, the stem-quadrant, the foot-quadrant, the structure and division of the nuclei in the embryo, subsequent growth of the young plant, and the relationships of the Marsiliaceæ. The study of the microspores is especially interesting, as the author succeeded in removing the exosporium and following the development of the prothallium and antheridium with great precision. The characters of these structures are much more nearly those of the true ferns than has heretofore been supposed. In reference to this relationship the author says: "Botanists have long recognized the evident relationship of the Marsiliaceæ to the true ferns, especially to the Polypodiaceæ, and this view is strengthened by the very great resemblance in the structure of the antheridium. Whether a more complete knowledge of Salviniaceæ will show further relationships between them and the Marsiliaceæ is doubtful, for apart from both families being heterosporous, they have little in common."

The Families of Plants.

Engler and Prantl's magnificent work[3] has just reached the end of the second volume, the first one completed. It makes a book of 1024 pages, and contains 803 illustrations, which are made up of 3537 separate figures. These illustrations are not only abundant, but are of the finest execution. The work must be of immense service to botanists, and the low price of the parts places it within the reach of all. The various parts have been noticed in this journal, but with the conclusion of the volume it is a fitting time to note the contents. The orders presented are as follows: Alismaceæ (Buchenau), Amaryllidaceæ (Pax), Aponogetonaceæ (Engler), Araceæ (Engler), Bromeliaceæ (Wittmack), Burmanniaceæ (Engler), Butomaceæ (Buchenau), Cannaceæ (Petersen), Centrolepidaceæ (Hieronymus), Commelinaceæ (Schönland), Coniferæ (Eichler, Engler, Prantl), Cordaitaceæ (Engler), Cycadaceæ (Eichler, Engler, Prantl), Cy-

[2] CAMPBELL, DOUGLAS HOUGHTON.—The development of *Pilularia globulifera* L. [Reprint from Annals of Botany, Nov. 1888, pp. 233-264, with three plates.]

[3] ENGLER A. and PRANTL, K.—Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten insbesondere den Nutzpflanzen; bearbeitet unter Mitwirkung zahlreicher hervorragender Fachgelehrten. II Teil in sechs Abteilungen. Mit 3537 Einzelbildern in 803 Figuren, 3 Vollbildern, sowie Abteilungs-Registern. Leipzig: Wilhelm Engelmann. 1889.

clanthaceæ (Drude), Cyperaceæ (Pax), Dioscoreaceæ (Pax), Eriocaulaceæ (Hieronymus), Flagellariaceæ (Engler), Gnetaceæ (Eichler), Gramineæ (Hackel), Hæmodoraceæ (Pax), Hydrocharitaceæ (Ascherson, Gürke), Iridaceæ (Pax), Juncaceæ (Buchenau), Juncaginaceæ (Buchenau, Hieronymus), Lemnaceæ (Engler), Liliaceæ (Engler), Marantaceæ (Petersen), Mayacaceæ (Engler), Musaceæ (Petersen), Naiadaceæ (Magnus), Orchidaceæ (Pfitzer), Palmæ (Drude), Pandanaceæ (Graf zu Solms), Philydraceæ (Engler), Pontederiaceæ (Schönland), Potamogetonaceæ (Ascherson), Rapateaceæ (Engler), Restionaceæ (Hieronymus), Sparganiaceæ (Engler), Stemonaceæ (Engler), Taccaceæ (Pax), Triuridaceæ (Engler), Typhaceæ (Engler), Velloziaceæ (Pax), Zingiberaceæ (Petersen).

Minor Notices.

MR. A. P. MORGAN has distributed the first part of a paper upon North American Gastromycetes, published as a reprint from the *Jour. Cin. Soc. Nat. Hist.* The present part presents the 5 genera of Phalloideæ, accompanied by a colored plate of a new Mutinus. The next part will begin the Lycoperdaceæ. As an outline of the work the author states that the five orders of Gastromycetes are represented by genera as follows: Phalloideæ 5, Lycoperdaceæ 10, Sclerodermaceæ 7, Hymenogastraceæ 6, Nidulariaceæ 5.

THE REPORT of the botanist, Mr. Chas. H. Peck, of the New York State Museum of Natural History,[4] for the year 1887, was issued a short time ago, something over a year late. Fifty-two new species are described, all but two being Hymenomycetes. Altogether over a hundred species are added to the list already reported as belonging to the state flora. A very useful index of genera and species contained in the twenty-second to thirty-eighth reports is given. A paper on fungi destructive to wood, by Mr. P. H. Dudley, with four illustrations, is also included.

NO MORE IMPORTANT botanical contribution from the experiment stations has yet been published than the bulletin on "root rot of cotton or 'cotton blight,'" by Prof. L. H. Pammel.[5] The author found himself at the outset confronted with a subject on which almost nothing had been written, and regarding which there was great diversity of opinion. He has carefully considered the prominent views, but after a full study of the diseased plants concludes that the disease is due to an injury of the roots by a fungus mycelium. It also affects sweet potatoes.

[4]PECK, CHAS. H.—Report of the botanist. (41st Annual Rep. St. Mus. Nat. Hist., for 1887, pp. 49–122.) 8vo. Troy Press Co., 1888.

[5]PAMMEL, L. H.—Root rot of cotton or "cotton blight." (Texas Agricultural Experiment Station, Bulletin No. 4.) 18 pp., 8vo. Houston, 1889.

NOTES AND NEWS.

O. A. FARWELL, of Clifton, Mich., reports the rediscovery, in Michigan, of *Salix balsamifera* Barratt.

THE HERBARIUM of the Agricultural Department is to be transferred to the care of the Smithsonian Institution. The botanist of the department is to be curator of the herbarium.

SOMETHING of the uncertainties of British Hieracia may be inferred from the fact that in the last *Journal of Botany* (March) Mr. Frederick Hanbury describes four new species from that well explored country.

DR. S. O. LINDBERG, Professor of Botany and director of the botanic garden of the University of Helsingfors, a most distinguished and acute bryologist, died on the 20th of February after a short illness, in the 53d year of his age.

DR. J. B. DE TONI, of Venice, proposes to issue a Sylloge Algarum containing descriptions of all known species of algæ, and thus do for chlorophyllous thallophytes what Prof. Saccardo in his Sylloge Fungorum has done for those without chlorophyll.

MR. JOHN DONNELL SMITH has just issued an enumeration of the Guatemala plants, upon which he has been at work for the past two years. His distribution will be deferred until his return from Guatemala, for which country he sailed from New Orleans March 21.

THE BOTANICAL SOCIETY of Western Pennsylvania, located at Pittsburgh, has issued a neat calendar, containing a list of meetings, objects of the society, officers, and members. It can be had by addressing the Corresponding Secretary, Mr. J. D. Shafer, 159 Fourth avenue.

MR. JAS. M. MACOUN has published a handsome check-list of the vascular plants of Canada. It is based upon Prof. John Macoun's catalogue, but includes material that has been discovered or revised since the publication of that excellent work. It can be had for 50 cents, by addressing the author at Ottawa, Canada.

THE *Deutsche botanische Monatsschrift* has begun the publication of a news column, which its readers will doubtless find a welcome addition, even if it does not meet a deeply felt want in the German economy, as it most assuredly does in this country. We notice items referring to America and Australia, as well as to Germany.

PROFESSOR ERNST RUDOLPH VON TRAUTVETTER, author of a large number of papers on the Russian flora, died at St. Petersburg, January 24, 81 years of age. He was director of the St. Petersburg botanical garden from 1866 to 1875. A genus of American plants belonging to the Ranunculaceæ has been dedicated to him.

WE WOULD call attention to the collection of the late Rev. Joseph Blake, which is now offered for sale. It is nearly all mounted, is in excellent condition, and contains many of the plants of our oldest and best collectors. It contains nearly 2,500 species of United States plants, besides good sets from many foreign countries. Further information will be found upon our advertising pages.